Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
1	NAEMS: Dairy Emissions	Completed	June 2009

Project Name

National Air Emissions Monitoring Study (NAEMS): Air Emissions from California Dairies, Part I (NAEMS CA5B)

Project Description

Accurately assess emissions from livestock operations and compile a database for estimation of emission rates, promote a national consensus for emissions-estimation methods/procedures from livestock operations.Includes monitoring of VOCs and GHG emissions at a commercial dairy using open-path Fourier transform infrared (OP-FTIR) analyzer

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
F. Mitloehner	UC Davis	Ag Air Research Council (AARC)	$250,000
PI 2	Affiliation PI 2	Fund Source 2	Amount 2
PI 3	Affiliation PI 3	Fund Source 3	Amount 3

Results

See report website

Report Location

http://www.epa.gov/airquality/agmonitoring/techdocs.html

Related info 1

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Completed	Estimated Completion Date	May 2009
2	Dairy Emissions				

Project Name

National Air Emissions Monitoring Study (NAEMS): Air Emissions from California Dairies, Part II (NAEMS CA5B)

Project Description

Accurately assess emissions from livestock operations and compile a database for estimation of emission rates, promote a national consensus for emissions-estimation methods/procedures from livestock operations.Includes monitoring of VOCs and GHG emissions at a commercial dairy using open-path Fourier transform infrared (OP-FTIR) analyzer

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
F. Mitloehner	UC Davis	ARB	$40,000
PI 2	**Affiliation PI 2**	**Fund Source 2**	**Amount 2**
Y. Zhao	UC Davis		
PI 3	**Affiliation PI 3**	**Fund Source 3**	**Amount 3**

Results

See report website

Report Location

http://www.epa.gov/airquality/agmonitoring/techdocs.html

Related info 1

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
3	NAEMS: Dairy Emissions	Completed	May 2009

Project Name

National Air Emissions Monitoring Study (NAEMS): Air Emissions from California Dairies from California Dairies, Part III (NAEMS CA5B)

Project Description

Accurately assess emissions from livestock operations and compile a database for estimation of emission rates, promote a national consensus for emissions-estimation methods/procedures from livestock operations.Includes monitoring of VOCs and GHG emissions at a commercial dairy using open-path Fourier transform infrared (OP-FTIR) analyzer

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
F. Mitloehner	UC Davis	CDFA	$70,000
PI 2	**Affiliation PI 2**	**Fund Source 2**	**Amount 2**
Y. Zhao	UC Davis		
PI 3	**Affiliation PI 3**	**Fund Source 3**	**Amount 3**

Results

See report website

Report Location

http://www.epa.gov/airquality/agmonitoring/techdocs.html

Related info 1

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
4	NAEMS: Dairy Emissions	Completed	June 2012

Project Name

National Air Emissions Monitoring Study (NAEMS): Air Emissions from California Dairies, Part IV (NAEMS CA5B)

Project Description

Accurately assess emissions from livestock operations and compile a database for estimation of emission rates, promote a national consensus for emissions-estimation methods/procedures from livestock operations.Includes monitoring of VOCs and GHG emissions at a commercial dairy using open-path Fourier transform infrared (OP-FTIR) analyzer

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
F. Mitloehner	UC Davis	UC Davis, College of Ag and Env'al Sciences	$40,000
PI 2	**Affiliation PI 2**	**Fund Source 2**	**Amount 2**
Y. Zhao	UC Davis		
PI 3	**Affiliation PI 3**	**Fund Source 3**	**Amount 3**

Results

See report website

Report Location

http://www.epa.gov/airquality/agmonitoring/techdocs.html

Related info 1

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Completed	Estimated Completion Date	May 2010
5	Dairy Emissions				

Project Name

Process-Based Farm Emission Model to Estimate Air Emissions from California Dairies, contract 05-344

Project Description

Using biological principles and engineering studies, develop a feed/waste stream process-based dairy farm emission model for VOC emissions.

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
R. Zhang	UC Davis	ARB	$299,191
PI 2	**Affiliation PI 2**	**Fund Source 2**	**Amount 2**
F. Mitloehner	UC Davis	UC Davis	
PI 3	**Affiliation PI 3**	**Fund Source 3**	**Amount 3**
A. Goldstein	UC Berkeley	UC Berkeley	

Results

The emission models developed are useful for estimating the emission rate and total emissions of alcohols and VFAs from silages and manure storages on dairies. The models can be further expanded in the future to include other VOCs.

Report Location

http://www.arb.ca.gov/research/apr/past/05-344.pdf

Related info 1

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
6	Dairy Emissions	Completed	January 2007

Project Name

Dairy Air Quality Monitoring of ROG and Ammonia in the Central Valley of California

Project Description

Maintain staffing and supplies for field and laboratory work to continue the ARB funded ROG project ID 55.

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
C. Krauter	CSU Fresno	CSU Agricultural Research Initiative	$208,000
PI 2	Affiliation PI 2	Fund Source 2	Amount 2
D. Goorahoo	CSU Fresno	ARB	$104,000
PI 3	Affiliation PI 3	Fund Source 3	Amount 3
B. Goodrich	CSU Fresno	SJVAPCD	$104,000

Results

Four sources within the animal housing are were evaluated: flush lane, bedding, feed, and open lot. Highest ammonia fluxes were from the bedding and lowest were from feed. NH3 fluxes were just 3% of those measured at same site in 2004.

Report Location

http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs143_008799.pdf

Related info 1

http://www.epa.gov/ttn/chief/conference/ei15/session6/beene.pdf

Related info 2

http://www.epa.gov/ttn/chief/conference/ei14/session1/goorahoo_pres.pdf

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Completed	Estimated Completion Date	December 2008
7	Dairy Emissions				

Project Name

Evaluating Dairy Ammonia, Methane, and Hydrogen Sulfide Emissions Using Tunable Diode Lasers

Project Description

Develop real-time methods for evaluating process and time specific emission profiles for NH3, CH4, and H2S at dairies. A program to monitor ammonia emissions using the USEPA Emission Isolation Flux Chamber began in 2006 and continued through 2008. [No updates since 2006.]

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
D. Goorahoo	CSU Fresno	CSU Agricultural Research Initiative	$98,000
PI 2	**Affiliation PI 2**	**Fund Source 2**	**Amount 2**
C. Krauter	CSU Fresno	ARB	
PI 3	**Affiliation PI 3**	**Fund Source 3**	**Amount 3**
B. Goodrich	CSU Fresno	Boreal Laser	

Results

Four sources within the animal housing are were evaluated: flush lane, bedding, feed, and open lot. Highest ammonia fluxes were from the bedding and lowest were from feed. NH3 fluxes were just 3% of those measured at same site in 2004.

Report Location

http://www.deq.state.or.us/aq/dairy/docs/appendix/appendix_F.pdf

Related info 1

http://www.4cleanair.org/Documents/APCODetermination.pdf

Related info 2

Abstract on page 9 at this site: http://www.epa.gov/ttn/chief/conference/ei14/final2005.pdf

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
8	Dairy Emissions Mitigation	Completed	May 2009

Project Name

Dairy Operations: An Evaluation and Comparison of Baseline and Potential Mitigation Practices for Emissions Reductions In the San Joaquin Valley (Contract No. 04-343)

Project Description

Project is designed to obtain data needed to better estimate baseline dairy emissions and to estimate the emission reductions achievable with available control technologies.

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
C. Krauter	CSU Fresno	ARB	$250,000
PI 2	Affiliation PI 2	Fund Source 2	Amount 2
D. Goorahoo	CSU Fresno	possible matching funds - CSU	$250,000
PI 3	Affiliation PI 3	Fund Source 3	Amount 3
B. Goodrich	CSU Fresno		

Results

Feed was the dominant (60%) ROG source, followed by the open lots (25%), flush lanes (8%) and silage piles (7%).

Report Location

Report - http://www.arb.ca.gov/research/apr/past/04-343.pdf; Abstract - http://www.arb.ca.gov/research/abstracts/04-343.htm

Related info 1

http://www.epa.gov/ttn/chief/conference/ei15/session6/beene.pdf

Related info 2

Continuation of previous work

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
9	Dairy Emissions Mitigation	Completed	December 2006

Project Name

Air Emission Mitigation Techniques and Technologies for California Dairies

Project Description

Evaluate dairy PM10, 2.5, VOC, and ammonia emission mitigation practices for potential effectiveness. Includes lagoon and corral areas.

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
F. Mitloehner	UC Davis	Merced County via SWRCB and UC matching	$600,000
PI 2	Affiliation PI 2	Fund Source 2	Amount 2
R. Zhang	UC Davis		
PI 3	Affiliation PI 3	Fund Source 3	Amount 3
P. Robinson	UC Davis		

Results

Main VOCs from dairies are ethanol and methanol; Main EtOH and MeOH sources on dairies are fresh waste and fermented feed; flush waste systems are an important mitigation.

Report Location

http://www.arb.ca.gov/ag/caf/FrankMitloehnerDairySymposiumOct06.pdf

Related info 1

Project objective described in PowerPoint at:
ftp://ftp.arb.ca.gov/carbis/ag/agadvisory/mitloehner05jan26.pdf

Related info 2

SJVAPCD Aug. 2005 VOC Emission Factors for Dairies,
http://www.4cleanair.org/Documents/APCODetermination.pdf

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
10	Dairy VOC Emissions	Completed	June 2005

Project Name

Volatile Organic Compound (VOC) Emissions from Cows Fed Typical California Rations

Project Description

Measurements of alcohols, volatile fatty acids, phenols, and methane (CH4) emitted from nonlactating (dry) and lactating dairy cows and their manure under controlled conditions. The experiment was conducted in an environmental chamber that simulates commercial concrete-floored freestall cow housing conditions. The fluxes of methanol, ethanol, and CH4 were measured from cows and/or their fresh manure.

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
F. Mitloehner	UC Davis	US EPA	$75,000
PI 2	**Affiliation PI 2**	**Fund Source 2**	**Amount 2**
B. Flocchini	UC Davis		
PI 3	**Affiliation PI 3**	**Fund Source 3**	**Amount 3**
P. Robinson	UC Davis		

Results

Alcohols dominate the VOC spectrum by mass; Volatilization of VOCs from silage reduces feed quality and has air quality impacts

Report Location

Not Available

Related info 1

http://www.4cleanair.org/Documents/APCODetermination.pdf

Related info 2

UCD Dairy Air Quality Symposium presentation 10-11-06 available at:
http://www.arb.ca.gov/ag/caf/FrankMitloehnerDairySymposiumOct06.pdf

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
11	Dairy Emissions Mitigation	Completed	June 2007

Project Name

Effects of Liquid Dairy Manure Aeration on Air Quality and Nutrient Cycling

Project Description

This project will evaluate the air and water emission mitigation effects of a wastewater treatment technology for California dairies to determine whether/to what extent aerobic treatment systems can cost-effectively reduce environmental impacts associated with manure storage.

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
C. Collar	UCCE - Kings County	UC ANR	$30,000
PI 2	Affiliation PI 2	Fund Source 2	Amount 2
F. Mitloehner	UC Davis		
PI 3	Affiliation PI 3	Fund Source 3	Amount 3
J. McGarvey	USDA - ARS	UCCE	

Results

Report available as part of a book, $42

Report Location

Paper is presented in the book, "Dairy Manure Management: Treatment, Handling, and Community Relations". Available for $42 at:
http://www.nraes.org/nra_order.taf?_function=detail&pr_id=48&_UserReference=8429860989D767704899E01F

Related info 1

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Completed	Estimated Completion Date	2006
12	Dairy Waste				

Project Name

Characterization of Dairy Waste Management Strategies with Regard to Pathogens and Air Quality

Project Description

Examine the effect that aerobic and anaerobic treatments have on the microbiological and chemical properties of waste.

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
F. Mitloehner	UC Davis	USDA - ARS	$30,300
PI 2	**Affiliation PI 2**	**Fund Source 2**	**Amount 2**
R. Zhang	UC Davis		
PI 3	**Affiliation PI 3**	**Fund Source 3**	**Amount 3**

Results

Both aerobic and anaerobic digestion were shown to significantly reduce the concentration of total solids, BOD5, sulfate, phosphate, and anaerobic and coliform bacteria; however, only aerobic treatment reduced the levels of ammonia.

Report Location

Abstract available at:
http://www.ars.usda.gov/research/publications/publications.htm?SEQ_NO_115=195211

Related info 1

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
13	Dairy Emissions	Completed	September 2009

Project Name

Estimating and Reducing Air Emissions from Dairy Feeding Operations

Project Description

Identify and measure VOC sources in dairy feed operations

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
F. Mitloehner	UC Davis	USDA - CSREES	$278,000
PI 2	Affiliation PI 2	Fund Source 2	Amount 2
R. Zhang	UC Davis	USDA - ARS	
PI 3	Affiliation PI 3	Fund Source 3	Amount 3
C. Krauter	CSU Fresno	CSU Fresno	

Results

Major VOCs from feed are acetic acid and ethanol; process variables include silage composition, moisture content, silage density, silage age, silage exposure surface area, air temperature and wind velocity over the exposure surface area.

Report Location

Several study presentations, see below; no final report located.

Related info 1

http://www.ag.iastate.edu/wastemgmt/Mitigation_Conference_proceedings/CD_proceedings/Animal_Housing-Treatment/Calvo-Freestall_housing.pdf

Related info 2

http://www.airquality.nrcs.usda.gov/AAQTF/Documents/200809_201008/200905_FresnoCA/01_Zhang_AAQTF_200905.pdf

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Completed	Estimated Completion Date	June 2008
14	Dairy Nutrient				

Project Name

Nutrient Balances in California Dairy Herds

Project Description

Data from 51 randomly selected dairy farms in Merced County, in California's Central Valley, was used to evaluate the impact of minerals in drinking water on nutrient balances and to characterize the mineral composition of manure from lactating dairy cows.

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
A. Costillo	UCCE Merced	UC ANR	$40,000
PI 2	**Affiliation PI 2**	**Fund Source 2**	**Amount 2**
F. Mitloehner	UC Davis		
PI 3	**Affiliation PI 3**	**Fund Source 3**	**Amount 3**
D. Bacon	UCCE Tulare		

Results

A lactating dairy cow producing approximately 66 pounds of milk daily might excrete 750 ±117 grams of minerals daily. On some dairies, controlling these minerals could reduce manure production and subsequent land applications.

Report Location

http://californiaagriculture.ucanr.org/landingpage.cfm?article=ca.v061n02p90&abstract=yes

Related info 1

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
15	Dairy Emissions	Completed	March 2008

Project Name

Effects of Dietary Rumensin® on GHG and VOC Emissions from Lactating Dairy Cows

Project Description

Feed additives, like monensin sodium (monensin), have been thought to improve cattle health and productivity, and have been used for these reasons for decades. industry is the impact the dairy industry has on the environment. A main environmental concern associated with the dairy industry is the emission of volatile organic compounds (VOC) and greenhouse gases (GHG).

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
F. Mitloehner	UC Davis	Eli Lilly-Elanco	$50,000
PI 2	Affiliation PI 2	Fund Source 2	Amount 2
E. DePeters	USDA-ARS		
PI 3	Affiliation PI 3	Fund Source 3	Amount 3
J. MacGarvey	USDA - ARS		

Results

Improvements in feed efficiencies for rate of weight gain and milk production equate to reductions of GHG emissions per production unit. The use of ionophores has been shown to improve efficiency in the animal, although with inconsistent results.

Report Location

http://www.extension.org/pages/Environmental_Responses_to_Dietary_Monensin_in_Lactating_Dairy_Cows

Related info 1

Hamilton, S.W., E.J. DePeters, J.A. McGarvey, J. Lathrop, and F.M. Mitloehner. 2010. Greenhouse Gas, Animal Performance, and Bacterial Population Structure Responses to Dietary Monensin Fed to Dairy Cows. J. Environm. Qual. 39:1-9

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
16	Dairy Air Quality	Completed	May 2010

Project Name

Western Region Dairy Odor and Air Quality Education

Project Description

The goal of this Professional Development Program grant is to reduce the environmental impacts of dairy farming in the West as a way to promote and guarantee the sustainability of the milk and cheese industries. The grant recipients plan to train agricultural professionals, selected from around the dairy producing areas of the Western region, on the best management practices available to dairy producers to mitigate the degradation of air quality. Four hands-on workshops will be conducted, introducing participants to air quality issues, regulations and control practices. Webcasts will be made

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
P. Ndegwa	WSU	USDA - SARE	$89,000
PI 2	**Affiliation PI 2**	**Fund Source 2**	**Amount 2**
F. Mittloehner	UC Davis		
PI 3	**Affiliation PI 3**	**Fund Source 3**	**Amount 3**
R. Sheffield	Univ. of Idaho		

Results

Workshops completed

Report Location

No report, this was an educational effort

Related info 1

Other researchers from NM State (R. Hagevoort) and OSU (M. Gamroth)

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
18	Steer Emissions	Completed	2010

Project Name

Volatile Organic Compound and Greenhouse Gas Emissions from Growing and Finishing Feedlot Steers and Their Waste

Project Description

To quantify volatile organic compounds (alcohols, volatile fatty acids, amines, and phenols) and greenhouse gas (methane, nitrous oxide, and carbon dioxide) emissions from receiving, growing and finishing feedlot steers (enteric fermentation) and fresh waste using environmental chambers at UC Davis.

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
F. Mitloehner	UC Davis	California Cattlemen Assoc.	$169,590
PI 2	**Affiliation PI 2**	**Fund Source 2**	**Amount 2**
S. Trabue	USDA - ARS	California Feeder Council	$0
PI 3	**Affiliation PI 3**	**Fund Source 3**	**Amount 3**
		ARB/CCOS	$10,000

Results

The GHGs were mainly produced by enteric fermentation and respiration and differed across life stages of cattle. Compared with dairy cows, feedlot steers produce relatively less GHG, with ethanol and methanol below the detection limits.

Report Location

J Environ Qual. 2011 May-Jun;40(3):899-906. doi: 10.2134/jeq2010.0354

Related info 1

Costs to be split between the two funding sources

Related info 2

ftp://ftp.arb.ca.gov/carbis/ptsd/polcomm/011008/concon.pdf

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Completed	Estimated Completion Date	December 2006
19	Equipment Study				

Project Name

UC Equipment Matching Funds Program

Project Description

No description, but project cited at http://animalscience.ucdavis.edu/faculty/Mitloehner/pdf/Grants.pdf

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
F. Mitloehner	UC Davis	UC Davis, Chancellor for Research	$140,000
PI 2	Affiliation PI 2	Fund Source 2	Amount 2
PI 3	Affiliation PI 3	Fund Source 3	Amount 3

Results

Report Location

Not Applicable

Related info 1

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
20	Covered Lagoon Emissions	Completed	Februrary 2009

Project Name

Covered Lagoon Digester Emission Measurements

Project Description

Measurements of NH3, methane, and VOCs at dairies with CEC funded dairy digester installations. Evaluates the Dairy Power Production Program (DPPP). The DPPP was initiated to encourage the development of biologically based anaerobic digestion and gasification (" iogas") electricity generation projects on California dairies.

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
P. Sousa	WURD		$500,000
PI 2	**Affiliation PI 2**	**Fund Source 2**	**Amount 2**
M. Summers	Summers Consulting		
PI 3	**Affiliation PI 3**	**Fund Source 3**	**Amount 3**

Results

Producing electricity from livestock wastes is a primary benefit of the program. Estimated savings from generated power varied greatly between projects. Results are presented for emissions testing and biogas quality.

Report Location

http://www.energy.ca.gov/2009publications/CEC-500-2009-009/CEC-500-2009-009.PDF

Related info 1

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
22	Dairy PM, NH3 Sources	Completed	July 2005

Project Name

Agricultural sources of PM10 and ozone precursors

Project Description

Compile PM10 and NH3 emission factors. Measure concentrations of VOC relevant to to ozone formation upwind and downwind of dairies

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
R. Flocchini	UC Davis	USDA	$374,145
PI 2	**Affiliation PI 2**	**Fund Source 2**	**Amount 2**
C. Parnell	Texas A&M		
PI 3	**Affiliation PI 3**	**Fund Source 3**	**Amount 3**
R. Higashi	UC Davis		

Results

Developed PM10 and PM10 precursor emission factors and publishe several methodologies for estimating ammonia factors for animal production facilities in the western U.S.

Report Location

Several publications, see Related Info

Related info 1

http://www.reeis.usda.gov/web/crisprojectpages/192080.html

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
23	Dairy Emissions Modeling	Completed	June 2007

Project Name

Developing a Process Based Model for GHG for California Dairies

Project Description

Using biological principles and mass balance, develop a cradle-to-grave emissions model to provide greenhouse gas emissions estimates for dairies.

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
F. Mitloehner	UC Davis	CEC PIER	$119,000
PI 2	Affiliation PI 2	Fund Source 2	Amount 2
W. Salas	Applied Geosolutions		
PI 3	Affiliation PI 3	Fund Source 3	Amount 3
R. Zhang	UC Davis		

Results

The emission models developed are useful for estimating the emission rate and total emissions of alcohols and VFAs from silages and manure storages on dairies.

Report Location

http://www.arb.ca.gov/research/rsc/2-25-10/feb10adv.pdf

Related info 1

Funded with $500,000 total - $119,00 for Mitloehner portion

Related info 2

http://www.westerndairies.org/2009symposium/Mitloehner.pdf

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
24	Ammonia Modeling	Completed	2005

Project Name

Development of a Process-Based Ammonia Model for Livestock Sources

Project Description

Develop a process-based model of ammonia emissions from five types of animal feeding operations: dairy, beef, swine, chicken, and turkey.

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
G. Tonnesen	UC Riverside	LADCO	$250,000
PI 2	**Affiliation PI 2**	**Fund Source 2**	**Amount 2**
Z. Wang	UC Riverside		
PI 3	**Affiliation PI 3**	**Fund Source 3**	**Amount 3**
R. Zhang	UC Davis		

Results

Presents preliminary emission estimates developed from the process-based ammonia emission model.

Report Location

http://www.epa.gov/ttnchie1/conference/ei14/session1/mansell.pdf

Related info 1

Other researchers - J. Fadel, R. Zhang, G. Mansell, J. Haasbeek.

Related info 2

Abstract on page 9 at: http://www.epa.gov/ttn/chief/conference/ei14/final2005.pdf

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
25	Dairy Air Quality	Completed	March 2005

Project Name

Development of an Air Module Curriculum for the California Dairy Quality Assurance Program (CDQAP)

Project Description

Develop curriculum to assist producers in meeting the new air quality permit requirements

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
F. Mitloehner	UC Davis	US EPA	$50,000
PI 2	**Affiliation PI 2**	**Fund Source 2**	**Amount 2**
D. Meyer	UC Davis, CDQAP		
PI 3	**Affiliation PI 3**	**Fund Source 3**	**Amount 3**
M. Payne	CDQAP		

Results

Curriculum was delivered to more than 736 producers in 17 workshops in 8 counties.

Report Location

http://www.cdqa.org/reports/annual_report_2005.asp

Related info 1

http://www.4cleanair.org/Documents/APCODetermination.pdf

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
26	Dairy Ammonia Emissions	Completed	December 2005

Project Name

Laser-based Sensors for Monitoring Ammonia Emissions

Project Description

A trace-gas sensor based on fibre-amplifier enhanced photoacoustic spectroscopy has been developed for measuring ambient ammonia in agricultural settings. Field testing was performed in environmental chambers at UC Davis where the excreta from three Holstein cows were allowed to accumulate, providing a source of ambient ammonia.

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
C. Patel	Pranalytica, Inc.	USDA - SBIR I	$20,000
PI 2	**Affiliation PI 2**	**Fund Source 2**	**Amount 2**
F. Mitloehner	UC Davis		
PI 3	**Affiliation PI 3**	**Fund Source 3**	**Amount 3**

Results

The photoacoustic sensor measured ambient ammonia of cow excreta in an environmental chamber, over three days. Intercomparison measurements with FRM yielded good to excellent correlation.

Report Location

http://www.pranalytica.com/pdf/MST-16-1547-2005.pdf

Related info 1

$79,000 total; $20,000 for Mitloehner portion

Related info 2

Institute of Physics Publishing, Meas. Sci. Technol. 16 (2005) 1547-1553

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
27	Dairy Ammonia Emissions	Completed	December 2006

Project Name

Laser-based Sensors for Monitoring Ammonia Emissions

Project Description

A trace-gas sensor based on fibre-amplifier enhanced photoacoustic spectroscopy has been developed for measuring ambient ammonia in agricultural settings. Field testing was performed in environmental chambers at UC Davis where the excreta from three Holstein cows were allowed to accumulate, providing a source of ambient ammonia.

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
C. Patel	Pranalytica, Inc.	USDA - SBIR II	$75,000
PI 2	**Affiliation PI 2**	**Fund Source 2**	**Amount 2**
F. Mitloehner	UC Davis		
PI 3	**Affiliation PI 3**	**Fund Source 3**	**Amount 3**

Results

The photoacoustic sensor measured ambient ammonia of cow excreta in an environmental chamber, over three days. Intercomparison measurements with FRM yielded good to excellent correlation.

Report Location

http://www.pranalytica.com/pdf/MST-16-1547-2005.pdf

Related info 1

$350,000 ($75,000 for Mitloehner portion)

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Completed	Estimated Completion Date	July 2005
28	Pig Study				

Project Name

Effect of Atmospheric Ammonia on Pig Welfare

Project Description

Trace-gas sensor based on fibre-amplifier enhanced photoacoustic spectroscopy has been developed for measuring ambient ammonia in agricultural settings. Field testing was performed in environmental chambers at UC Davis where the excreta from three Holstein cows were allowed to accumulate, providing a source of ambient ammonia.

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
F. Mitloehner	UC Davis	National Pork Board	$40,000
PI 2	Affiliation PI 2	Fund Source 2	Amount 2
PI 3	Affiliation PI 3	Fund Source 3	Amount 3

Results

Under the conditions of these studies, prolonged exposure to NH3 is associated with increases in absolute monocyte, lymphocyte, and neutrophil counts and in serum cortisol and haptoglobin concentrations, but has no effect on pig growth performance.

Report Location

http://www.aasv.org/shap/issues/v15n3/v15n3p137.pdf

Related info 1

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
29	Dairies	Completed	September 2011

Project Name

Respiratory Exposures and Health of Workers on California Dairies (NIOSH)

Project Description

Monitor exposures of 200 dairy workers at large dairies to dust and ammonia to define the concentrations of any airborne pollutants highly associated with respiratory problems.

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
F. Mitloehner	UC Davis	NIOSH	$1,700,000
PI 2	Affiliation PI 2	Fund Source 2	Amount 2
M. Schenker	UC Davis		
PI 3	Affiliation PI 3	Fund Source 3	Amount 3
D. Bennett	UC Davis		

Results

Dairy work in California was associated with a significantly increased prevalence of asthmatic symptoms but not with significantly increased chronic cough, phlegm, or wheezing.

Report Location

http://factsreports.revues.org/492

Related info 1

UC Davis' program - CA Dairy Environ Health Research Inititative (Cal-DEHRI)

Related info 2

Field phase in progress, June 2008

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
30	Ozone Impacts	Completed	February 2006

Project Name

Investigation of Atmospheric Ozone Impacts of Selected Pesticides

Project Description

Develop methods for estimating and quantifying ozone impacts for selected pesticide compounds for which such estimates are not currently available.

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
W. Carter	UC Riverside	ARB	$100,000
PI 2	**Affiliation PI 2**	**Fund Source 2**	**Amount 2**
I. Malkina	UC Riverside		
PI 3	**Affiliation PI 3**	**Fund Source 3**	**Amount 3**

Results

Established chemical mechanism and quantitative ozone impact estimates for 10 pesticide compounds

Report Location

Report of Jan. 10, 2007 available at: http://www.arb.ca.gov/research/apr/past/04-334.pdf

Related info 1

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
31	VOC Emissions	Completed	August 2008

Project Name

Agricultural Pesticide VOC Sources and their Photochemical Ozone Formation Potential

Project Description

Improve current understanding of the photochemical O3 formation potential of VOCs from agricultural pesticide applications in the San Joaquin Valley.

PI	Affiliation PI	Fund Source	Amount
PI 1: R. Flocchini	UC Davis	USDA	$400,000
PI 2: R. Higashi	UC Davis		
PI 3: M. Kleeman	UC Davis		

Results

Two sources other than insecticide solvents may be the key pre-cursors: nitrogen oxides from engines and VOCs from spilled or incompletely combusted fuels. Biogenic VOC forms a larger background source of pre-cursors than the solvents themselves.

Report Location

http://www.reeis.usda.gov/web/crisprojectpages/204179.html

Related info 1

http://airquality.ucdavis.edu/pages/events/2008/green_acres/GREEN.pdf

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
32	Pesticide Fumigation Water Seal	Completed	2005

Project Name

Commercialization of Intermittent Water Sealing

Project Description

Identify optimal water management strategies for water sealing commercial-scale application of fumigants.

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
D. Sullivan	Sullivan Environmental	USDA	$78,000
PI 2	**Affiliation PI 2**	**Fund Source 2**	**Amount 2**
H. Ajwa	UC Davis		
PI 3	**Affiliation PI 3**	**Fund Source 3**	**Amount 3**
J. Radewald	UC Davis		

Results

VIF tarps were slightly more effective in reducing CP emissions than the LDPE tarps. Reduction of CP emissions should focus on the raised beds where emissions were dominant rather than on furrows.

Report Location

http://www.sciencedirect.com/science/article/pii/S0045653508003913

Related info 1

http://mbao.org/2005/MBAO%202005%20pdfs/Preplant/8/Sullivan.pdf

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
33	Soil Ammonia Emissions	Completed	December 2005

Project Name

Improved Statewide Estimates of Ammonia Emissions from Native Soils in California

Project Description

Develop California specific ammonia emission factors and modeling for native soils within California

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
C. Krauter	CSU Fresno	ARB	$200,000
PI 2	**Affiliation PI 2**	**Fund Source 2**	**Amount 2**
C. Potter	NASA Ames		
PI 3	**Affiliation PI 3**	**Fund Source 3**	**Amount 3**
S. Klooster	CSU Monterey		

Results

NH3 flux profiles were calculated from the data for a variety of soil/vegetation communities in central California. The magnitude and characteristics of the NH3 flux profiles were compared to similar data from other research outside California.

Report Location

http://www.epa.gov/ttn/chief/conference/ei12/part/krauter.pdf (2003)

Related info 1

http://geo.arc.nasa.gov/sge/casa/regional/california.html

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
34	Crop ammonia Emissions	Completed	June 2005

Project Name

Monitoring of Ammonia Emissions from Crop Production With a Tunable Diode Laser

Project Description

Evaluate the use of a TDL system for the determination of ambient ammonia levels and ammonia emissions from specific agricultural operations.

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
C. Krauter	CSU Fresno	CSU Agricultural Research Initiative	$296,000
PI 2	Affiliation PI 2	Fund Source 2	Amount 2
D. Goorahoo	CSU Fresno	ARB	$148,000
PI 3	Affiliation PI 3	Fund Source 3	Amount 3
B. Goodrich	CSU Fresno	Unisearch	$148,000

Results

Highest levels of NH3 seen on day after applications; levels return to pre-application levels in 2 days.

Report Location

Partial, 2005 EPA conference. http://www.epa.gov/ttn/chief/conference/ei14/index.html (search Krauter)

Related info 1

http://www.epa.gov/ttn/chief/conference/ei14/session1/goorahoo_pres.pdf

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status		Estimated Completion Date	
35	Crop PM Emissions	Drafting Final Report		Dec. 2012	

Project Name
Cotton Gin PM Emissions Research, contract 09-01PM

Project Description
Evaluate the accuracy of US EPA's sampling methods which may significantly over-estimate PM emissions (CTM-039, P 2.5 Stack Sampling Method). Develop PM dispersion models for PM10, PM2.5, total suspended particulates (TSP). Characterize particle size, shape. Six test sites, 1 in CA.

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
D. Whitelock	ARS - SW Cotton Ginning Research	Various cotton industry and ginners associations	$147,500
PI 2	Affiliation PI 2	Fund Source 2	Amount 2
M. Buser	OK State Univ.	ARB	$45,000
PI 3	Affiliation PI 3	Fund Source 3	Amount 3
C. Boykin	Cotton Ginning Rese	SJVAPCD	$36,000

Results
too extensive to summarize, see reports link.

Report Location
Quarterhttp://buser.bioen.okstate.edu/air-quality/national-cotton-gin-technical-reportsly reports submitted during research phase

Related info 1

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
36	Crop PM Emissions	Completed	2011

Project Name

Particulate Matter Emissions from Raisin Harvest

Project Description

Compare PM emissions of raisin harvesting techniques: conventional tray, continuous tray, dried on vine.

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
Alex Alexandrou	CSU Fresno	USDA-NRCS	$0
PI 2	Affiliation PI 2	Fund Source 2	Amount 2
C. Krauter	CSU Fresno	SJVAPCD	$0
PI 3	Affiliation PI 3	Fund Source 3	Amount 3
S. Ashkan	CSU Fresno		$0

Results

Tilling dry soil repeatedly to prepare the surface for either the conventional trays or the continuous tray and then to return the vineyard surface to its original condition generates the most PM of any raisin production operation.

Report Location

Under review by SJVAPCD, April 2012

Related info 1

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
37	Emissions Mitigation	Completed	2010

Project Name

Testing to Determine Emissions Reductions Achieved by Lower Emitting Agricultural Practices

Project Description

Evaluation of control effectiveness of two SJVAPCD Conservation Management Practices for PM (conservation tillage and combined operations)

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
US EPA RARE Study		US EPA RARE	
PI 2	Affiliation PI 2	Fund Source 2	Amount 2
		USDA	
PI 3	Affiliation PI 3	Fund Source 3	Amount 3
		SJVAPCD	

Results

The combined operations cultivator reduced PM10 by 60%. Conservation tillage/strip till reduced all PM emissions by more than 85%. The potential to combine operations for either CMP varies by crop. Fuel reduction benefits were not evaluated.

Report Location

Available as pdf via search terms from cfpub.eap.gov

Related info 1

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Completed	Estimated Completion Date	October 2007
39	Pesticide VOC Emissions				

Project Name

DPR Round-Robin VOC Study

Project Description

Determine ways to improve VOC emission estimates for solvents in pesticide formulations by comparing the emissions under field conditions to emissions seen in traditional TGA testing. Results showed more ozone production on the downwind side, but only slightly. Most of the VOC increase after spraying is NOT from the solvent being regulated but from EtOH in fuel. To decrease ozone, NOx reduction more important than VOC reduction.

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
P. Green	UC Davis	USDA-CSREES	$0
PI 2	**Affiliation PI 2**	**Fund Source 2**	**Amount 2**
PI 3	**Affiliation PI 3**	**Fund Source 3**	**Amount 3**

Results

Results showed slightly more ozone production on the downwind side. Most of the VOC increase after spraying is NOT from the solvent being regulated but from EtOH in fuel. To decrease ozone, NOx reduction is more important than VOC reduction.

Report Location

presentation at CDPR, date unknown:
http://www.cdpr.ca.gov/docs/emon/vocs/vocproj/voc_regional_ozone.pdf

Related info 1

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Completed	Estimated Completion Date	December 2009
40	Soil VOC Emissions Mititgation				

Project Name

Reducing Emissions of VOCs from Agricultural Soil Fumigation, ARB contract 05-351

Project Description

Original study plus extension: Develop estimates for cumulative and hourly emissions rates from laboratory, field plot and predictive models which will be compared to previous large-scale field experiments on several emission reduction strategies

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
Scott Yates	UC Riverside	ARB	$200,000
PI 2	**Affiliation PI 2**	**Fund Source 2**	**Amount 2**
Jay Gan	UC Riverside	USDA-ARS	$100,000
PI 3	**Affiliation PI 3**	**Fund Source 3**	**Amount 3**
M. Majewski	UC Riverside		

Results

Sprinkler irrigation can reduce atmospheric emissions of 1,3-D can be reduced by approximately 50% compared to conventional application methods. Emissions were reduced 80% by applying composted municipal green waste to the upper 15 cm of the soil.

Report Location

http://www.arb.ca.gov/research/apr/past/05-351.pdf

Related info 1

ARB agreement 05-351

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Completed	Estimated Completion Date	August 2001
41	Dairy & Feedlot Emissions				

Project Name

Sources and Sinks of PM10 in the San Joaquin Valley

Project Description

Evaluate on-field PM10 emissions. Evaluate PM10 and ammonia emissions for feedlots and dairies.

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
R. Flocchini	UC Davis	USDA	
PI 2	**Affiliation PI 2**	**Fund Source 2**	**Amount 2**
T. Cassel	UC Davis		
PI 3	**Affiliation PI 3**	**Fund Source 3**	**Amount 3**

Results

Summary data provided for Lidar-assisted measurements emission during cultural operations in 6 crops, and for 4 activities in dairy cows and beef cattle. Crop emission factors were used to update the Land Prep and Ag Harvest methodologies.

Report Location

http://www.arb.ca.gov/research/apr/reports/l2022.pdf

Related info 1

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Completed	Estimated Completion Date	June 2001
42	Ammonia Emissions				

Project Name

Statewide Inventory Estimates of Ammonia Emissions from Native Soils and Chemical Fertilizers in California

Project Description

Measure and model ammonia emissions from agricultural fertilizer application and natural soils. Report available at: ftp://ftp.arb.ca.gov/carbis/reports/l522.pdf

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
C. Krauter	CSU Fresno	ARB	$186,425
PI 2	**Affiliation PI 2**	**Fund Source 2**	**Amount 2**
C. Potter	NASA Ames	NASA Ames	
PI 3	**Affiliation PI 3**	**Fund Source 3**	**Amount 3**
S. Klooster	CSU Monterey		

Results

Highly consistent emission factors among most fertilizer application forms and methods.

Report Location

http://geo.arc.nasa.gov/sge/casa/california.html

Related info 1

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Completed	Estimated Completion Date	June 1996
43	Dairy PM10 Emissions				

Project Name
Results of the Measurement of PM10 Precursor Compounds from Dairy Industry Livestock Waste

Project Description
Using environmental flux chambers, evaluate dairy ammonia and ROG emissions.

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
C. Schmidt	Consultant	South Coast AQMD	
PI 2	Affiliation PI 2	Fund Source 2	Amount 2
PI 3	Affiliation PI 3	Fund Source 3	Amount 3

Results
Foundation work for subsequent studies

Report Location
http://www.epa.gov/ttn/chief/conference/ei14/session1/schmidt.pdf
Related info 1
http://www.aqmd.gov/rules/proposed/pr1127.html
Related info 2
http://www.epa.gov/ttn/chief/conference/ei14/session1/schmidt.pdf

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
44	Dairy VOC Emissions	Completed	January 1995

Project Name

Results of the Measurement of Volatile Organic Compounds from Livestock Wastes

Project Description

Evaluate process specific VOCs from dairies in the Sacramento region.

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
C. Schmidt	Consultant	US EPA	
PI 2	**Affiliation PI 2**	**Fund Source 2**	**Amount 2**
PI 3	**Affiliation PI 3**	**Fund Source 3**	**Amount 3**

Results

Foundation work for subsequent studies

Report Location

Related info 1

http://www.4cleanair.org/Documents/APCODetermination.pdf

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
45	Dairy Waste Management	Completed	January 2002

Project Name

Survey Current Livestock Waste Management Practices in the South Coast Air Basin

Project Description

Evaluate manure management practices in the SCAQMD

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
Egigian-Nichols	Tetra Tech Inc	South Coast AQMD	
PI 2	**Affiliation PI 2**	**Fund Source 2**	**Amount 2**
PI 3	**Affiliation PI 3**	**Fund Source 3**	**Amount 3**

Results

Support for SCAQMD Rule 1127, Emission Reductions from Livestock Waste

Report Location

http://www.aqmd.gov/rules/support.html#r1127

Related info 1

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
46	Waste Management	Completed	March 2003

Project Name

Literature Survey and National Programs, Livestock Waste Management Practices Survey and Control Option Assessment

Project Description

Literature survey of waste management and control options.
http://www.aqmd.gov/rules/proposed/pr1127.html

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
Egigian-Nichols	Tetra Tech Inc	South Coast AQMD	
PI 2	**Affiliation PI 2**	**Fund Source 2**	**Amount 2**
PI 3	**Affiliation PI 3**	**Fund Source 3**	**Amount 3**

Results

Report Location

http://www.aqmd.gov/rules/support.html

Related info 1

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Completed	Estimated Completion Date	March 2003
47	Waste Management				

Project Name

Identify Potential Waste Management Practices Reducing Ammonia and VOCs, Livestock Waste Management Practices Survey and Control Option Assessment

Project Description

Identify livestock practices to reduce emissions. http://www.aqmd.gov/rules/proposed/pr1127.html

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
Egigian-Nichols	Tetra Tech Inc	South Coast AQMD	
PI 2	**Affiliation PI 2**	**Fund Source 2**	**Amount 2**
PI 3	**Affiliation PI 3**	**Fund Source 3**	**Amount 3**

Results

Support for SCAQMD Rule 1127, Emission Reductions from Livestock Waste

Report Location

http://www.aqmd.gov/rules/support.html

Related info 1

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Completed	Estimated Completion Date	December 2003
48	Waste Management				

Project Name

Emissions of Particulate Matter and Ammonia from Cattle Feedyards and Dairies: a Texas-California Partnership

Project Description

Quantify the effects of water application and manure harvest frequency on PM and NH3 emission from dry lots housing beef or dairy animals (heifers).

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
B. Auvermann	TAMU CEC	National Center for Manure and Animal Waste	$12,000
PI 2	**Affiliation PI 2**	**Fund Source 2**	**Amount 2**
W. Harman	TAMU CEC		
PI 3	**Affiliation PI 3**	**Fund Source 3**	**Amount 3**
D. Meyer	UC Davis		

Results

PM10/TSP in feedyard dust increases immediately after rainfall, then decreases rapidly to the typical value as the feedyard dries out; annualized NH3 flux from cattle feedyards is likely to be between 40 and 50% of the total N fed to the animals.

Report Location

Related info 1

http://ag.arizona.edu/ANS/swnmc/Proceedings/2006/Auvermann_SWNMC2006.pdf

Related info 2

http://amarillo.tamu.edu/library/files/brent_auvermann_publications/conference_proceedings/preliminaryevaluation_18.pdf

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
49	Dairy Emissions	Completed	May 2006

Project Name

Evaluating Dairy Process Emissions Using Flux Chambers

Project Description

Using environmental flux chambers at a working dairy, evaluate relative emission levels of individual process including lagoons, flush lanes, and corrals.

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
C. Schmidt	Contractor	ARB	$50,000
PI 2	Affiliation PI 2	Fund Source 2	Amount 2
		SJVAPCD	
PI 3	Affiliation PI 3	Fund Source 3	Amount 3

Results

CCOS Phase II Results: Average process-specific emission flux data from 6 dairy process units were measured. Also conducted method verification and flux chamber technique validation of assessment capabilities for volatile fatty acids.

Report Location

Phase II Tech Memo at: http://www.arb.ca.gov/ag/caf/SchmidtDairyTestData2005.pdf

Related info 1

http://www.4cleanair.org/Documents/APCODetermination.pdf

Related info 2

http://www.epa.gov/ttn/chief/conference/ei14/session1/schmidt.pdf

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
50	Dairy Emissions	Completed	December 2005

Project Name

Measuring Dairy Cow Emissions in an Environmental Chamber

Project Description

Place cows into an environmentally controlled chamber and evaluate speciated VOC emissions emitted directly from cows and from fresh waste products.

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
F. Mitloehner	UC Davis	US EPA	$75,000
PI 2	**Affiliation PI 2**	**Fund Source 2**	**Amount 2**
R. Flocchini			
PI 3	**Affiliation PI 3**	**Fund Source 3**	**Amount 3**
J. Peters			

Results

Methane emissions were associated with enteric fermentation. Ethanol and methanol were produced during enteric fermentation and increased in correspondence with accumulated waste.

Report Location

Final Report May 31, 2006. http://www.arb.ca.gov/ag/caf/MitloehnerDairyChamberEmissions2006.pdf

Related info 1

http://www.4cleanair.org/Documents/APCODetermination.pdf

Related info 2

J Environ Qual 37:615-622 (2008)

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
51	Dairy Emissions	Completed	May 2006

Project Name

Volatile Fatty Acids, Amine, and Phenol Emissions from Cows and their Waste

Project Description

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
F. Mitloehner	UC Davis	ARB	$200,000
PI 2	**Affiliation PI 2**	**Fund Source 2**	**Amount 2**
S. Trabue	USDA ARS		
PI 3	**Affiliation PI 3**	**Fund Source 3**	**Amount 3**
J. Koziel	ISU		

Results

CH4 emissions were associated with enteric fermentation. VFA and phenol concentrations were present at low levels, primarily from waste. EtOH and MeOH were produced during enteric fermentation and increased in correspondence with accumulated waste.

Report Location

http://www.arb.ca.gov/ag/caf/MitloehnerDairyChamberEmissions2006.pdf

Related info 1

http://www.4cleanair.org/Documents/APCODetermination.pdf

Related info 2

http://jeq.scijournals.org/cgi/content/full/37/2/615

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Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
52	Almond Harvest Emissions	Completed	June 2004

Project Name

Improvement of PM10 emission factors for almond harvesting

Project Description

Refine existing PM10 emission factors for almond harvesting. Estimates based on measured PM10 during almond sweeping and pick up.

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
R. Flocchini	UC Davis	Almond Board of California	
PI 2	**Affiliation PI 2**	**Fund Source 2**	**Amount 2**
C. Parnell	Texas A&M		
PI 3	**Affiliation PI 3**	**Fund Source 3**	**Amount 3**

Results

Results showed that in all instances, the concentrations obtained from using the PM10 sampler were always higher than those obtained from using the TSP sampler.

Report Location

http://caaqes.tamu.edu/Publications/Publications/PU01107.pdf

Related info 1

http://asae.frymulti.com/abstract.asp?aid=20039&t=2

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
53	Dairy VOC Emissions	Completed	July 2007

Project Name

Photochemical Ozone Formation Potential of Agricultural VOC Sources

Project Description

Some recent estimates predict that dairy cattle are second only to on-road vehicles as a leading source of ozone precursor emissions in California's San Joaquin Valley. The objective of this work was to directly measure the ozone formation potential from dairy housing.

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
P. Green		USDA	$300,000
PI 2	**Affiliation PI 2**	**Fund Source 2**	**Amount 2**
F. Mitloehner			
PI 3	**Affiliation PI 3**	**Fund Source 3**	**Amount 3**
R. Flocchini			

Results

Ozone formation potential of emissions from dairy cattle was much lower than predicted using regulatory profiles. The majority of the ozone formation is explained by ethanol (EtOH) emissions, not by acetone as previously thought.

Report Location

http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VH3-4S0YXTM-2&_user=1928924&_rdoc=1&_fmt=&_orig=search&_sort=d&view=c&_version=1&_urlVersion=0&_userid=1928924&md5=e020b1203499a23d500c0127b4460438

Related info 1

presentation at CDPR, date unknown:
http://www.cdpr.ca.gov/docs/emon/vocs/vocproj/voc_regional_ozone.pdf

Related info 2

Alternate site for report: Go to http://dx.doi.org and enter "doi:10.1016/j.atmosenv.2008.02.064"

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Completed	Estimated Completion Date	May 2005
54	Broiler Emissions				

Project Name

Measuring Broiler Emissions in Tunnel Ventilated Housing

Project Description

Emissions of PM10, ammonia and organic gasses were measured periodically during the 55 day poultry production cycle including 45 days of production and 10 days between broods.

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
M. Summers	CDFA	California Poultry Federation	$40,000
PI 2	**Affiliation PI 2**	**Fund Source 2**	**Amount 2**
D. Duke	Foster Farms		
PI 3	**Affiliation PI 3**	**Fund Source 3**	**Amount 3**

Results

An EF of 0.0143 lb/bird raised for ammonia and 0.0061 lb/bird raised for total organic gasses is estimated. The estimated EF for ROG (organic compounds with ozone forming reactivity) is 0.0037 lb/bird raised. An EF for PM10 could not be generated.

Report Location

http://www.arb.ca.gov/ag/caf/poulemisrpt.pdf

Related info 1

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
55	Dairy ROG Emissions	Completed	December 2005

Project Name

Evaluating Dairy Reactive Organic Gas Emissions

Project Description

Chemically speciate ROG samples collected at dairies. Attempt to develop emission factors for dairies and some individually tested dairy processes. Further study continues in 2005-2008 (project IDs 6, 7, 8).

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
C. Krauter	CSU Fresno	ARB	$100,000
PI 2	Affiliation PI 2	Fund Source 2	Amount 2
D. Goorahoo	CSU Fresno	CSU Foundation	$20,000
PI 3	Affiliation PI 3	Fund Source 3	Amount 3
B. Goodrich	CSU Fresno		

Results

Report - http://www.arb.ca.gov/research/apr/past/04-343.pdf; Abstract - http://www.arb.ca.gov/research/abstracts/04-343.htm

Report Location

http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs143_008799.pdf

Related info 1

http://www.4cleanair.org/Documents/APCODetermination.pdf

Related info 2

http://www.epa.gov/ttn/chief/conference/ei15/session6/beene.pdf

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
56	Dairy Waste Management	Completed	September 2008

Project Name

Dairy Wastewater Treatment Feasibility Study, Contract 08-279

Project Description

Assess the feasibility of applying standard wastewater treatment technology to the management of manure from cows in typical California dairies. EPA plans to incorporate this information into its on-going
assessment of technologies for dairy manure management.

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
Trygve Lundquist	Cal-Poly SLO	US EPA	$19,936
PI 2	Affiliation PI 2	Fund Source 2	Amount 2
			$0
PI 3	Affiliation PI 3	Fund Source 3	Amount 3
			$0

Results

On some dairies, controlling these minerals could reduce manure production and subsequent land applications.

Report Location

(When available) http://www.epa.gov/region09/ag/dairy/technologies.html

Related info 1

http://www.arb.ca.gov/ag/caf/dairypnl/dairypanel.htm

Related info 2

http://works.bepress.com/tlundqui/2/

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
57	Soil VOC Emissions Mitigation	Completed	June 2011

Project Name

Reducing Emissions of VOCs from Agricultural Soil Fumigation: Comparing Emission Estimates from Simplified Methodology, ARB contract 07-332

Project Description

For a single soil, determine the extent to which laboratory and modeling studies can simulate field emission data. Extend the range of emission reduction strategies assessable in the field using the laboratory and modeling approaches. Variables under investigation include columns/furrows, with tarped/untarped, VIF vs. HPDE covered beds/furrows.

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
Scott Yates	USDA-ARS-Riverside	ARB	$100,000
PI 2	**Affiliation PI 2**	**Fund Source 2**	**Amount 2**
Daniel Ashworth	USDA-ARS	DPR	$50,000
PI 3	**Affiliation PI 3**	**Fund Source 3**	**Amount 3**
			$0

Results

See Report

Report Location

http://www.arb.ca.gov/research/rsc/10-28-11/item4dfr07-332.pdf

Related info 1

ARB agreement 07-332

Related info 2

USDA project 5310-12130-008-05

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
58	Greenwaste VOC Emissions	Completed	January 2010

Project Name

Emission of GHGs Resulting from Greenwaste Composting (09-01 CCOS)

Project Description

Construct 5 windrows, monitor oxygen, pH, ammonia, nitrate, nitrite, nitric oxide, methane, hydrogen sulfide and moisture at the core of the windrows; collect emission flux samples using a isolation flux chamber and analyze samples for methane, carbon dioxide, nitrous oxide, and IVMNEOC for 100 days

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
Fatih Buyuksonmez	UC San Diego	SJVAPCD	$198,000
PI 2	Affiliation PI 2	Fund Source 2	Amount 2
			$0
PI 3	Affiliation PI 3	Fund Source 3	Amount 3
			$0

Results

The results suggest that the thermography approach can be used effectively in determining sampling locations. The mitigation alternatives investigated resulted in mixed conclusions in terms of reducing emissions for particular VOCs.

Report Location

http://valleyair.org/busind/pto/emission_factors/Criteria/Criteria/Composting/FINAL-COMPOST-STUDY-REPORT.pdf

Related info 1

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
59	NAEMS: Layer Emissions	Completed	July 2010

Project Name

NAEMS Project: Air Emissions from California Layer Farms (NAEMS CA2B)

Project Description

This project is for conducting a two-year measurement and monitoring of air emissions from a layer farm in CA. The emissions from two mechanically ventilated layer houses are measured. The houses have approximately 68,000 hens in cages. The measured emissions include ammonia, hydrogen sulfide, carbon dioxide, volatile organic compounds, total suspended particulates, PM2.5 and PM10. In addition, the detailed information and data are collected on ventilation, indoor and outdoor environmental conditions, chicken feeding and management, manure handling and management

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
R. Zhang	UC Davis	Ag Air Research Council	$199,000
PI 2	Affiliation PI 2	Fund Source 2	Amount 2
			$0
PI 3	Affiliation PI 3	Fund Source 3	Amount 3
			$0

Results

Pending

Report Location

Interim site data: http://www.epa.gov/airquality/agmonitoring/data.html

Related info 1

Data under review/compilation by US EPA

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
60	NAEMS: Broiler Emissions	Completed	July 2010

Project Name

NAEMS Project: Air Emissions from California Broiler Farms (NAEMS CA1B)

Project Description

This project is for conducting a two-year measurement and monitoring of air emissions from a broiler farm in CA. The emissions from two mechanically ventilated broiler barns are measured. The two broiler barns house about 42,000 broilers in each chicken production cycle. The measured emissions include ammonia, hydrogen sulfide, carbon dioxide, methane, nitrous oxide, ethanol, volatile organic compounds, total suspended particulates, PM2.5 and PM10. In addition, the detailed information and data are collected on ventilation, indoor and outdoor environmental conditions, chicken feeding and

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
R. Zhang	UC Davis	Ag Air Research Council	$219,000
PI 2	Affiliation PI 2	Fund Source 2	Amount 2
			$0
PI 3	Affiliation PI 3	Fund Source 3	Amount 3
			$0

Results

See report website

Report Location

http://www.epa.gov/airquality/agmonitoring/techdocs.html

Related info 1

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
61	Soil NOx Emissions	Completed	February 2014

Project Name

Assessment of Baseline Nitrous Oxide Emissions in California Dairy Systems, Contract 09-325

Project Description

N2O emissions will be measured in silage corn systems of three dairy farms in Stanislaus County. The N2O flux will be measured intensively, using static chamber techniques. Annual N2O emissions will be calculated. The annual N inputs in the form of solid manure, lagoon water, and synthetic fertilizer will be accounted for to enable calculation of the fraction of applied N that was emitted as N2O, i.e., the system specific emission factor.

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
William Horwath	UC Davis	ARB	$82,000
PI 2	Affiliation PI 2	Fund Source 2	Amount 2
		EDF	$100,000
PI 3	Affiliation PI 3	Fund Source 3	Amount 3
			$0

Results

N contributions from concentrated applications of N fertilizer exceeded incremental N applications from lagoon water and fertigation. Soil type affected emissions. Overall, EFs were less than or equal to previously published EFs.

Report Location

Final draft report submitted March 2013

Related info 1

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Completed	Estimated Completion Date	February 2014
62	Soil NOx Emissions				

Project Name

Determining NOx Emissions from Soil in California Cropping Systems to Improve Ozone Modeling, Contract 09-329

Project Description

This is an add-on component to the three on-going baseline nitrous oxide (N2O) monitoring efforts. The results of the study are expected to provide an estimate of NOx emissions from California's agricultural soils and ozone modeling input by including NOx emissions from the soil. See Project IDs 77, 78, 79, & 81.

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
William Horwath	UC Davis	ARB	$83,500
PI 2	**Affiliation PI 2**	**Fund Source 2**	**Amount 2**
M. Burger	UC Davis		$0
PI 3	**Affiliation PI 3**	**Fund Source 3**	**Amount 3**
			$0

Results

NOx flux ranges are predictable at recommended N rates. With high N inputs, emissions can be enhanced 10X for several days due to high soil NH4+. The magnitude of diel NOx emissions depend on soil temperature.

Report Location

Description: http://www.arb.ca.gov/research/single-project.php?row_id=64853

Related info 1

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
63	Biogenic VOC Emissions	Completed	May 2011

Project Name

Flux Measurements of Biogenic Precursors to Ozone and Particulate Matter in the Central Valley, Contract 06-329

Project Description

Develop BVOC simulation platform for central valley agricultural operations and test the modeling performance through ozone and aerosol nucleation event measurements. Micro-meteorological to landscape level emission flux measurement program for certain selected crops identified during the screening phase.

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
Allen Goldstein	UC Berkeley	ARB	$400,003
PI 2	**Affiliation PI 2**	**Fund Source 2**	**Amount 2**
John Karlik	UC Berkeley, Ag Ext		$0
PI 3	**Affiliation PI 3**	**Fund Source 3**	**Amount 3**
			$0

Results

Phase I: BVOC emissions at branch/whole plant scale were characterized in a greenhouse for over 20 key crops. Phase II: canopy scale flux measurements made at citrus orchard site continuously over a full year. See report for details.

Report Location

http://www.arb.ca.gov/research/rsc/06-09-11/agenda3_contract%2006-329_dfr_ash.pdf

Related info 1

http://www.arb.ca.gov/research/rsc/10-28-11/oct11book.pdf

Related info 2

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Janet Spencer, ARB Air Quality Planning and Science Division
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Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
64	Biogenic VOC Emissions	In Progress	June 2013

Project Name

Improving Regional Biogenic VOC Emissions Estimate Using an Airborne PTR MS Eddy Flux Measurement System, contract 09-339

Project Description

Collect regional concentrations data for the full suite of BVOC species, develop new land cover databases, with proper scaling methodology. The results of this project would strengthen ARB BVOC inventory and improve the modeling of ozone and aerosols in ARB SIP.

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
Allen Goldstein	UC Berkeley	ARB	$400,000
PI 2	Affiliation PI 2	Fund Source 2	Amount 2
Alex Guenther	Natl Center Atm Res		$0
PI 3	Affiliation PI 3	Fund Source 3	Amount 3
Halfidi Jonsson	CIRPAS		$0

Results

Report Location

Related info 1

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
65	Removing H2S from Biogas	Draft protocol	December 2010

Project Name

Removal of H2S from Biogas and NOx from Engine Exhaust at a Dairy Digester Using Microwave Technology, contract #ICAT 0803

Project Description

The project will monitor the performance of the H2S removal system and the NOx removal system on the biogas powered engine at the Tollenaar Holsteins Dairy Farm. Anaerobic digester gas (biogas) is captured from a heated, mixed digester and used to fuel a 212 kW Guascor engine-generator. H2S is currently removed from the biogas using an aerated water bubbler system (Soloscrub).

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
Mark Rawson	SMUD	SMUD	$246,309
PI 2	Affiliation PI 2	Fund Source 2	Amount 2
Chang Cha	Cha Corporation		$0
PI 3	Affiliation PI 3	Fund Source 3	Amount 3
Dan Greenberg	Applied Filter Techno		$0

Results

Report Location

Related info 1

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
66	Fumigant Emissions Mitigation	Completed	2007

Project Name

Reductions of Fumigant Emissions using Irrigation and Virtually Impenetrable Film (VIF)

Project Description

Reductions of Fumigant Emissions using Irrigation and Virtually Impenetrable Film (VIF) for 1,3-D, chloropicrin, methyl bromide

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
Steve Fennimore	UC Davis	USDA-CSREES	$0
PI 2	Affiliation PI 2	Fund Source 2	Amount 2
Husein Ajwa	UC Davis	Stawberry Commission	$0
PI 3	Affiliation PI 3	Fund Source 3	Amount 3
			$0

Results

Results suggest that drip-applied chloropicrin and 1,3-D may potentially be economically feasible alternatives to methyl bromide in commercial CA strawberry production. Using VIF instead of high-density polyethelyne may improve economic feasibility

Report Location

http://www.agecon.ucdavis.edu/extension/update/articles/v9n5_3.pdf

Related info 1

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
67	Fumigant Emissions Mitigation	Completed	2006

Project Name

Reductions of Fumigant Emissions using Irrigation and Virtually Impenetrable Films (VIF)

Project Description

Reductions of Fumigant Emissions using Irrigation and Virtually Impenetrable Films (VIF) for 1,3-D and Chloropicrin

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
Thomas Trout	USDA-ARS		$0
PI 2	**Affiliation PI 2**	**Fund Source 2**	**Amount 2**
S. Gao	USDA-ARS		$0
PI 3	**Affiliation PI 3**	**Fund Source 3**	**Amount 3**
			$0

Results

Results consistently show that water applications to the soil surface can reduce emissions more effectively than HDPE tarp, especially for 1,3-D.

Report Location

http://www.epa.gov/osp/hstl/AgCon.proceedings_print.pdf

Related info 1

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
68	Fumigant Emissions Mitigation	Completed	2007

Project Name

Reductions of Fumigant Emissions using Irrigation and Virtually Impermeable Films (VIF)

Project Description

Reductions of Fumigant Emissions using Irrigation and Virtually Impermeable Films (VIF) for 1,3-D, Chloropicrin and methyl bromide

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
Husein Ajwa	UC Davis	UC Davis	$0
PI 2	Affiliation PI 2	Fund Source 2	Amount 2
			$0
PI 3	Affiliation PI 3	Fund Source 3	Amount 3
			$0

Results

Results suggest that drip-applied chloropicrin and 1,3-D may potentially be economically feasible alternatives to methyl bromide in commercial CA strawberry production. Using VIF instead of high-density polyethelyne may improve economic feasibility

Report Location

http://www.ars.usda.gov/research/publications/publications.htm?SEQ_NO_115=185286

Related info 1

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
69	Fumigant Emissions Mitigation	Completed	2007

Project Name

Reductions of Fumigant Emissions using Irrigation

Project Description

Evaluation of reductions in fumigant emissions using tarps; focus on 1,3-D.

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
Husein Ajwa	UC Davis	UC Davis	$0
PI 2	**Affiliation PI 2**	**Fund Source 2**	**Amount 2**
			$0
PI 3	**Affiliation PI 3**	**Fund Source 3**	**Amount 3**
			$0

Results

Results suggest that drip-applied chloropicrin and 1,3-D may potentially be economically feasible alternatives to methyl bromide in commercial CA strawberry production. Using VIF instead of high-density polyethelyne may improve economic feasibility

Report Location

http://mbao.org/2008/035Ajwa.pdf

Related info 1

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
70	Soil Nox Emissions Modeling	In progress	May 31, 2014

Project Name

Calibrating, validating, and implementing process models for CA agriculture greenhouse gas emission estimation, ARB contract #10-309

Project Description

Improve earlier attempts of companion projects to calibrate & valdiate N2O models for CA conditions and estimate N2O emissions for CA crop specific fertilizer levels, measure N2O flux and physical variables

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
Changsheng Li	Univ New Hampshire	ARB	$250,000
PI 2	Affiliation PI 2	Fund Source 2	Amount 2
William Salas	Applied GeoSolution		$0
PI 3	Affiliation PI 3	Fund Source 3	Amount 3
			$0

Results

Report Location

Related info 1

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
71	Soil Nox Emissions Mitigation	In Progress	March 31, 2015

Project Name

Evaluating Mitigation Options of Nitrous Oxide Emissions in California Cropping Systems, ARB Contract No. 11-313

Project Description

Evaluate alternative management practices with greatest promise of reducing annual N2O emissions while maintaining productivity in lettuce, corn and tomatoes. Proposed strategies are: targeting fertilizer types and timing of their application, delaying nitrification by using urease and nitrification inhibitors, spatially decreasing the concentration of applied N fertilizer, and modifying irrigation methods.

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
Martin Burger	UC Davis	ARB	$400,000
PI 2	Affiliation PI 2	Fund Source 2	Amount 2
			$0
PI 3	Affiliation PI 3	Fund Source 3	Amount 3
			$0

Results

Report Location

Related info 1

http://www.arb.ca.gov/research/single-project.php?row_id=65096

Related info 2

www.arb.ca.gov/ag/fertilizer/meetings/Proposal11-313.pdf

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
72	Tilling Emissions	Completed	September 2011

Project Name

MISTING: A Viable Conservation Management Practice For Reducing PM10 Generated by Disking

Project Description

Quantify and substantiate PM-reducing potential of an existing DCU misting apparatus attached to a common agricultural disk, as well as other variables such as temperature reductionof dsut plume, emission facotrs, night farming

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
Alex Alexandrou	CSU Fresno	USDA-NRCS	$210,651
PI 2	Affiliation PI 2	Fund Source 2	Amount 2
C. Krauter	CSU Fresno	ARI	$420,000
PI 3	Affiliation PI 3	Fund Source 3	Amount 3
S. Ashkan	CSU Fresno		$0

Results

The dust control unit (DCU) reduced PM10 an average of 22.2%; other evaluatiosn were unsuccessful or inconclusive.

Report Location

http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1046764.pdf

Related info 1

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
73	Almond Harvest Emissions	Completed	2010

Project Name

Effects of sweeping depth on particulate matter emissions from almond harvest operations

Project Description

Evaluate the effects of sweeper depth on particulate matter (PM) emissions from sweeping and pickup operations

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
Brock Faulkner	TAMU		$0
PI 2	**Affiliation PI 2**	**Fund Source 2**	**Amount 2**
S. Capareda	TAMU		$0
PI 3	**Affiliation PI 3**	**Fund Source 3**	**Amount 3**
			$0

Results

PM10 emissions during pickup of windrows formed using lower sweeper settings were approximately 2.5 times those from pickup of windrows formed using equipment set according to manufacturer recommendations.

Report Location

http://www.atmospolres.com/articles/Volume3/issue2/APR-12-024.pdf

Related info 1

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Completed	Estimated Completion Date	2009
74	Almond Harvest Emissions				

Project Name

Improving PM10 Emission Factors for Almond Sweeping and Harvesting

Project Description

Update almond sweeping and harvesting emission factors using dispersion modeling

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
Brock Faulkner	TAMU	Almond Bd of CA	$0
PI 2	Affiliation PI 2	Fund Source 2	Amount 2
B. Goodrich	Trinity Consultants		$0
PI 3	Affiliation PI 3	Fund Source 3	Amount 3
S. Capareda	TAMU		$0

Results

Based on study results and evaluation by the SJV Ag Tech Subcommittee, recommend ARB adopt PM10 almodn harvestign emission factor of 31.2 lb PM10/ac (23% lower than 2003 emission factor)

Report Location

Proprietary, Almond Board of CA

Related info 1

http://betalab.tamu.edu/Papers/Almond/AnnualReport2010.pdf

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
75	Almond Harvest Emissions	Completed	2011

Project Name

Particulate matter emission factors for almond harvest as a function of harvester speed

Project Description

Evaluate reduction in almond harvesting PM for reducign harvester ground speed from 5 mph to 2.5 mph usign ISCST3 and AERMOD to back calculate emission rates

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
Brock Faulkner	TAMU		$0
PI 2	Affiliation PI 2	Fund Source 2	Amount 2
B. Goodrich	Trinity Consultants		$0
PI 3	Affiliation PI 3	Fund Source 3	Amount 3
V. Botlaguduru	TAMU		$0

Results

AERMOD, ISCST3 yielded estiamted PM10 at <10% current emissiosn factor. Harvester speed reduction reduced TSP by 42% but had no effect on PM10, PM2.5.

Report Location

Abstract: http://www.tandfonline.com/doi/abs/10.3155/1047-3289.59.8.943

Related info 1

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
76	Almond Harvest Emissions	Completed	2011

Project Name

Harvesting Equipment to Reduce PM Emissions from Almond Harvest Operations

Project Description

Compare emissions from new almond harvesting systems and retrofit abatement devices to emissions from a conventional harvester

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
Brock Faulkner	TAMU	USDA-NRCS	$0
PI 2	Affiliation PI 2	Fund Source 2	Amount 2
		SJVAPCD	$0
PI 3	Affiliation PI 3	Fund Source 3	Amount 3
			$0

Results

Emissions of TSP and PM10 trended lower for all new harvesters and were significantly lower for most harvesters without affectign product quality

Report Location

Not available

Related info 1

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
77	Soil NOx Emissions	Completed	2012

Project Name

Fertilizer N2O Research, Assessment of Baseline Nitrous Oxide and Nitric Oxide Emissions in California Cropping Systems, ARB Contract No. 08-324)

Project Description

Researchers are coordinating study goals and methods on 4 separate studies to evaluate flux emissions of N2O using typical fertilizer practices for each crop. Work began in June 2009. Measuring nitrous oxide flux in tomato, wheat, lettuce, rice, vineyard, orchard and alfalfa systems to develop emission factors. See also Project IDs 62, 78, 79 & 81.

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
William Horwath	UC Davis	ARB	$300,000
PI 2	Affiliation PI 2	Fund Source 2	Amount 2
PI 3	Affiliation PI 3	Fund Source 3	Amount 3
		CDFA	

Results

Summer fluxes are highest. Emission factors are somewhat less than 1%, except for tomatoes and alfalfa, which were ~1.5-2%

Report Location

4-14-12: Final Report: http://www.arb.ca.gov/research/apr/past/08-324.pdf

Related info 1

See Project ID 62, contract 09-329, which is an add-on to study nitric acid

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
78	Soil NOx Emissions	In Progress	2013

Project Name

Fertilizer N2O Research, Assessment of Baseline Nitrous Oxide and Nitric Oxide Emissions in California Cropping Systems (CEC Contract)

Project Description

Researchers are coordinating study goals and methods on 4 separate studies to evaluate flux emissions of N2O using typical fertilizer practices for each crop. Work began in June 2009. Measuring nitrous oxide flux in tomato, wheat, lettuce, rice, vineyard, orchard and alfalfa systems to develop emission factors. See also Project IDs 62, 77, 79 & 81.

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
Johan Six			$500,000
PI 2	**Affiliation PI 2**	**Fund Source 2**	**Amount 2**
			$0
PI 3	**Affiliation PI 3**	**Fund Source 3**	**Amount 3**
			$0

Results

Report Location

Related info 1

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
79	Soil NOx Emissions	In Progress	June 2013

Project Name

Measuring and Modeling Nitrous Oxide Emissions from California Cotton and Tomato Cropping Systems (CDFA Contract)

Project Description

Researchers are coordinating study goals and methods on 4 separate studies to evaluate flux emissions of N2O using typical fertilizer practices for each crop. Work began in June 2009. Measuring nitrous oxide flux in tomato, wheat, lettuce, rice, vineyard, orchard and alfalfa systems to develop emission factors. See also Project IDs 62, 77, 78 & 81.

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
Dave Goorahoo			$150,000
PI 2	**Affiliation PI 2**	**Fund Source 2**	**Amount 2**
			$0
PI 3	**Affiliation PI 3**	**Fund Source 3**	**Amount 3**
			$0

Results

Report Location

Related info 1

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
80	Dairy Emissions Mitigation	In Progress	2015

Project Name

Quantification of the Emission Reduction Benefits of Mitigation Strategies for Dairy Silage, ARB Contract No. 11-325

Project Description

Silage emissions include criteria pollutants (e.g. VOCs, NOx) and greenhouse gases. This project aims to quantify and model the effectiveness of various mitigation practices (such as maintaining a smooth pile face, storing silage in ag bags, etc.) on the various emissions species. Factors such as silage exposure surface area, temperature, air velocity, etc. will also be measured and analyzed.

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
F. Mitloehner	UC Davis	ARB	$400,000
PI 2	Affiliation PI 2	Fund Source 2	Amount 2
Y. Zhao	UC Davis		$0
PI 3	Affiliation PI 3	Fund Source 3	Amount 3
P. Green	UC Davis		$0

Results

Report Location

Related info 1

Atmospheric Environment. 2010, 44:1989-1995; Atmospheric Environment. 2010, 44: 4172-4180; J. Environ. Qual. 2011, 40:1–9, Env. Sci. & Technol. 2010, 44: 2309-2314; Trans. ASABE. 2011, 53: 1-7

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
81	Soil NOx Emissions	In Progress	Dec. 31, 2015

Project Name

Assessment of Baseline Nitrous Oxide Emission in Response to a Range of Nitrogen Fertilizer Application Rates in Corn Systems (CDFA Contract)

Project Description

Researchers are coordinating study goals and methods on 4 separate studies to evaluate flux emissions of N2O using typical fertilizer practices for each crop. Work began in June 2009. Measuring nitrous oxide flux in tomato, wheat, lettuce, rice, vineyard, orchard and alfalfa systems to develop emission factors. See also Project IDs 62, 77, 78 & 79.

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
Martin Burger	UC Davis	CDFA	$92,542
PI 2	**Affiliation PI 2**	**Fund Source 2**	**Amount 2**
W. Horwath	UC Davis		$0
PI 3	**Affiliation PI 3**	**Fund Source 3**	**Amount 3**
			$0

Results

Report Location

Related info 1

www.cdfa.ca.gov/is/docs/12-0453-SABurger.pdf

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
82	Soil Nox Emissions Mitigation	Completed	March 2012

Project Name

Assessing practices and influencing policy to mitigate nitrous oxide (N2O) emissions from California Agriculture

Project Description

Evaluate N2O mitigation potential of nitrogen management practices and N use efficiencies in important CA cropping systems.

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
Martin Burger	UC Davis	Packard Foundation	$350,000
PI 2	Affiliation PI 2	Fund Source 2	Amount 2
W. Horwath	UC Davis		$350,000
PI 3	Affiliation PI 3	Fund Source 3	Amount 3
			$0

Results

Report Location

Not Available

Related info 1

http://nitrogen.ucdavis.edu/research/nitrogen/documents

Related info 2

http://c-agg.org/cm_vault/files/docs/C-AGG_Presentation-2_29_2012_%28MFitzGibbon-ARB%29.pdf

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
83	Soil Nox Emissions Mitigation	In Progress	June 2013

Project Name

Use of Walnut Biochar to improve soil properties and reduce N2O emissions

Project Description

Researchers are investigating the influence of biochar on the coil N cycle and carbon sequestration in a variety of crops. This study evaluates biochar from walnut shells applied to the walnuts orchards as compost.

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
Johan Six	UC Davis	CEC	$80,834
PI 2	Affiliation PI 2	Fund Source 2	Amount 2
			$0
PI 3	Affiliation PI 3	Fund Source 3	Amount 3
			$0

Results

Interim results for 2012 indicate that there is limited benefit and much variability

Report Location

Preliminary: http://www.plantsciences.ucdavis.edu/Agroecology/Outreach/Walnut.html

Related info 1

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
84	Soil NOx Emissions	In Progress	2014

Project Name

Compost Life Cycle Analysis

Project Description

Evaluate N2O and CH4 emissions in compost production and from applications of finished compost to almonds, tomatoes and row crops.

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
William Horwath	UC Davis	CalRecycle	$450,000
PI 2	Affiliation PI 2	Fund Source 2	Amount 2
			$0
PI 3	Affiliation PI 3	Fund Source 3	Amount 3
			$0

Results

The range of NOx fluxes are predictable in cropping systems fertilized at recommended N rates. Emissions from systems receiving high N inputs can be enhanced 10X for several days in response to high soil ammonium availability.

Report Location

Final draft report submitted April 2013

Related info 1

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
85	Dairy Emissions Mitigation	Draft Proposal	

Project Name

Development of Methodology to Assess Dairy Silage Management Practices to Reduce Emissions of Volatile Organic Compounds

Project Description

Develop screening methodology to assess the VOC emissions potential of silage piles. Validate the methodology with measurements at different stages from ensiling to delivery to feed lanes. Assess reductions associated with various mitigation measures.

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
Deeane Meyer	UC Davis	CDFA	$219,000
PI 2	Affiliation PI 2	Fund Source 2	Amount 2
Peter Robinson	UC Davis	Dairy CARES	$0
PI 3	Affiliation PI 3	Fund Source 3	Amount 3
Jennifer Heguy	UCCE Stanislaus Co		$0

Results

Report Location

Related info 1

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
86	Dairy Nox Emissions	Completed	2012

Project Name

NOx emissions from a Central California dairy

Project Description

NOx and ozone were measured at a commercial dairy in Central California during 2011–12. Ambient and flux chamber measurements assessed the potential contribution of dairy feed to NOx emissions. Additional flux chamber measurements were also made using fresh silage from the dairy on the Fresno State campus.

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
Alam Hasson	CSU Fresno	USDA AFRI	
PI 2	Affiliation PI 2	Fund Source 2	Amount 2
Shawn Ashkan	CSU Fresno	Nat'l Science Foundation	$0
PI 3	Affiliation PI 3	Fund Source 3	Amount 3
Steven Trabue	Nat'l Lab for Ag & En		$0

Results

NOx concentrations were 2–4 times higher than background during the summer due to the presence of up to 40 ppb NO.Flux chamber measurements were substantially lower. Emissions from feed may be significant on a regional scale.

Report Location

Atmos. Environ. Vol. 70, 2013, pp 328-336. http://dx.doi.org/10.1016/j.atmosenv.2013.01.011

Related info 1

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
87	Raisin Harvest Emissions	Completed	2013

Project Name

Air Curtain Burner Evaluation

Project Description

SJVAPCD demonstration project: Modify and test Burn Boss Air Curtain Burner to burn paper harvesting trays in the field. Modified unit with PTO for tractor use, portability.

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
Sun-maid Growers	Sun-Maid Growers		$10,000
PI 2	**Affiliation PI 2**	**Fund Source 2**	**Amount 2**
Nisei Farmers			$0
PI 3	**Affiliation PI 3**	**Fund Source 3**	**Amount 3**
Kfar Equipment Co.			$0

Results

Unit was very effective, opacity tests showed no emissions. Wil be available to growers in 2013. Limitations includes capacity/work rate, cost of unit, 6 week harvest window, burn days and burn periods on burn days.

Report Location

Not available

Related info 1

http://www.valleyair.org/Workshops/postings/2012/12-20-12PM25/FinalVersion/07%20Chapter%207%20Technology%20Advancement.pdf

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
88	Reducing Groundwater Nitrates	In Progress	2015

Project Name

Optimizing the Use of Groundwater Nitrogen for Nut Crops

Project Description

Nitrate nitrogen research on advance grower practice using the "pump and fertilize" method in vulnerable groundwater areas for almond and pistachios. The research will evaluate whether the “pump and fertilize” method is effective in reducing use of nitrogen fertilizer based on the nitrates available in the ground water, and subsequently reduces nitrate levels in groundwater aquifers.

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
David Smart	UC Davis	CDFA/FREP	$473,000
PI 2	Affiliation PI 2	Fund Source 2	Amount 2
Patrick Brown	UC Davis		$0
PI 3	Affiliation PI 3	Fund Source 3	Amount 3
Jan Hopmans	UC Davis		$0

Results

Not available

Report Location

Not available

Related info 1

http://www.cdfa.ca.gov/is/ffldrs/frep/index.html

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
89	Soil Nox Emissions Modeling	In progress	Sept. 2016

Project Name

Improving DNDC Modeling Capability to Quantify Mitigation Potential of Nitrous Oxide from California Agricultural Soils

Project Description

This project will develop and deliver a modeling tool that will allow for the quantification of the emission reduction potentials from various N2O mitigation strategies that have been identified through previous ARB research. Previous studies have delivered to ARB a validated California-specific modeling tool based on DeNitrification-DeComposition (DNDC), incorporating largely business as usual management practices for baseline emission assessment. However, the model needs further development to address changes in management designed for GHG mitigation

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
Changsheng Li	Univ New Hampshire	ARB	$112,000
PI 2	Affiliation PI 2	Fund Source 2	Amount 2
William Salas	Applied GeoSolution	Applied GeoSolutions	$88,000
PI 3	Affiliation PI 3	Fund Source 3	Amount 3
			$0

Results

Report Location

Related info 1

See Project ID 70

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717

Date: 10/9/2014

California Air Resources Board
Emission Inventory Branch
Summary of Agricultural Emissions Research in California

Project ID	Project Type	Status	Estimated Completion Date
90	Dairy & Feedlot PM10 Mitigation	Completed	Sept. 2014

Project Name

Assessment of Control Methods for PM10 Emissions from Dairy and Feedlot Corrals

Project Description

Particulate matter testing at four dairies and feedlots was conducted to determine emission rates and assess the efficacy of various PM10 emission control methods. The control measures tested included: no control, sprinklers, scrape and remove, modified feed time, and scrape/remove/replace.

PI 1	Affiliation PI 1	Fund Source 1	Amount 1
Eric Winegar	Winegar Air Sciences	CDFA	$120,000
PI 2	Affiliation PI 2	Fund Source 2	Amount 2
		SJVAPSA	$19,000
PI 3	Affiliation PI 3	Fund Source 3	Amount 3
			$0

Results

The sprinkler site showed the lowest overall emissions.

Report Location

https://docs.google.com/file/d/0B8uymxkFP0nwemRUZTdjejFqb2c/edit?usp=drive_web&pli=1

Related info 1

Related info 2

Please provide project updates and corrections to:
Janet Spencer, ARB Air Quality Planning and Science Division
jspencer@arb.ca.gov, 916.324.2717